UPSC Prelims Test Series 2020

Phase II, Test 10: Science and Technology

ANSWER KEYS:

Q. No.	Ans	Q. No.	Ans	Q. No.	Ans
1	B	41	B	81	A
2	C	42	D	82	D
3	D	43	C	83	A
4	A	44	A	84	B
5	C	45	A	85	A
6	B	46	A	86	A
7	B	47	B	87	C
8	A	48	A	88	C
9	A	49	D	89	A
10	B	50	C	90	C
11	C	51	A	91	C
12	A	52	C	92	C
13	B	53	C	93	A
14	D	54	D	94	C
15	A	55	D	95	A
16	D	56	B	96	A
17	A	57	C	97	C
18	A	58	D	98	B
19	D	59	D	99	D
20	B	60	B	100	A
21	D	61	C		
22	D	62	Cancel		
23	D	63	C		
24	D	64	A		
25	B	65	B		
26	B	66	C		
27	A	67	C		
28	D	68	B		
29	B	69	C		
30	D	70	A		
31	A	71	A		
32	A	72	C		
33	B	73	B		

34	C	74	C		
35	C	75	A		
36	D	76	C		
37	A	77	B		
38	C	78	B		
39	C	79	Cancel		
40	B	80	C		

Que1: B

Schedule X describes the habit forming and narcotics drugs list. Schedule X describes the list of drugs that covered in schedule. They include following substances (API) Amobarbital, Amphetamine , Methylphenidate , Barbital , Methylphenobarbital , Cyclobarbital , Pentobarbital , Dexamphetamine , Phencyclidine , Ethclorvynol , Phenometrazine , Glutethimide , Meprobamate , Secobarbital , Methamphetamine.

Union health ministry has launched Anti-Microbial Resistance awareness campaign urges people not to use medicines marked with a red vertical line, including antibiotics, without a doctor's prescription.
These medicines are called as the 'Medicines with the Red Line'.
To check the irrational use of antibiotics, the 'red line' will helps the users to differentiate them from other drugs.
Union Ministry of Health Affair has made it mandatory to display a 5mm-thick red vertical band (line) on packaging of prescription-only drugs (those which compulsorily require Doctors' Prescription) so as to sensitise people and make them cautious while buying these Antibiotic medicines

Que2: C

BIRAC is a not-for-profit Section 8, Schedule B, Public Sector Enterprise, set up by Department of Biotechnology as an Interface Agency to strengthen and empower the emerging Biotech enterprise to undertake strategic R&D, addressing nationally relevant product development needs.
BIRAC is an industry-academia interface and implements its mandate through a wide range of impact initiatives, be it providing access to risk capital through targeted funding, technology transfer, IP

management and handholding schemes that help bring innovation excellence to the biotech firms and make them globally competitive.
To create a globally competitive biopharmaceutical industry that addresses the country's major concerns around barriers to affordable healthcare, ' Innovate in India (i3)' program was launched by the Department of Biotechnology (DBT and is a first- of-its-kind mission that brings together industry and academia to promote entrepreneurship and indigenous manufacturing in the biopharmaceutical sector.
This flagship program of the GOI in collaboration with World Bank, will be implemented by Biotechnology Industry Research Assistance Council (BIRAC).
This programme is focussed on targeted measures to develop platform technologies for product validation, link disparate institutions to strengthen clinical trial networks, promote partial de-risking for novel products, and build capacities in emerging areas such as translational bioinformatics, bioethics etc.

Que3: D

Ambient air quality refers to the condition or quality of air surrounding us in the outdoors. National Ambient Air Quality Standards are the standards for ambient air quality set by the Central Pollution Control Board (CPCB) that is applicable nationwide. The CPCB has been conferred this power by the Air (Prevention and Control of Pollution) Act, 1981.
Sulphur Dioxide, Nitrogen Dioxide, PM 10, PM 2.5, Ozone, Lead, Carbon Monoxide, Ammonia, Benzene, Benzo(a)Pyrene (BaP), Arsenic, Nickel are measured under NAAQS.

Que 4: A

If it's an old fashioned tungsten-filament bulb, the sound is implosive decompression.

The reason they implode is that during the manufacturing process, all (most) of the air is sucked out, creating a partial vacuum inside the lamp. The electric bulb has a partial vacuum. When it is broken the air rushes to fill the space and a bang or loud sound is heard.

The partial vacuum is maintained so that the filament doesn't 'burn' when it heats up, which it otherwise would due to the high temperature and reaction with oxygen.

Que 5: C

Synthetic gas or Syngas or producer gas can be produced from many sources, including natural gas, coal, biomass, or virtually any hydrocarbon feedstock, by reaction with steam, carbon dioxide or oxygen.
Syngas is a crucial intermediate resource for production of hydrogen, ammonia, methanol, and synthetic hydrocarbon fuels. Syngas is also used as an intermediate in producing synthetic petroleum for use as a fuel or lubricant via the
Production methods include steam reforming of natural gas or liquid hydrocarbons to produce hydrogen, the gasification of coal,biomass, and in some types of waste-to-energy gasification facilities.

LPG is prepared by refining petroleum or "wet" natural gas, being manufactured during the refining of petroleum (crude oil), or extracted from petroleum or natural gas streams as they emerge from the ground.

In petrochemistry, petroleum geology and organic chemistry, cracking is the process whereby complex organic molecules such as kerogens or long-chain hydrocarbons are broken down into simpler molecules such as light hydrocarbons, by the breaking of carbon-carbon bonds in the precursors.

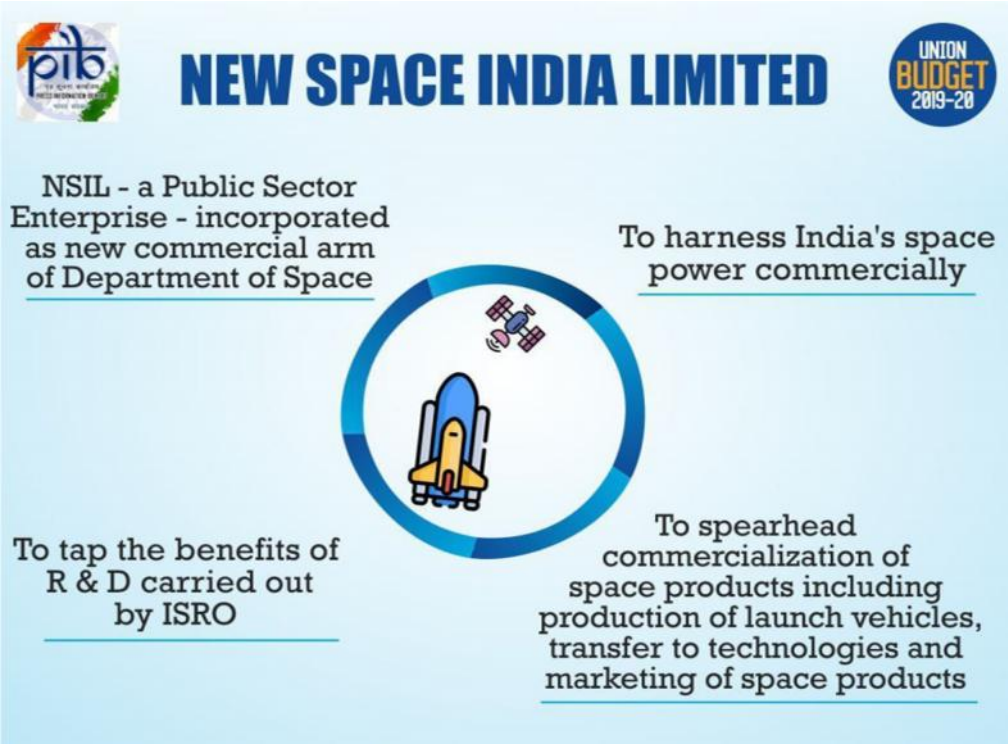
Fluid catalytic cracking produces a high yield of petrol and LPG, while hydrocracking is a major source of jet fuel, Diesel fuel, naphtha, and again yields LPG.

Que 6: B

The maximum density of water occurs at 4 °C because, at this temperature two opposing effects are in balance. In ice, the water molecules are in a crystal lattice that has a lot of empty space. When the ice melts to liquid water, the structure collapses and the density of the liquid increases?

Since water when reaches below 4 deg, it expands rather than contracting, this property is called Anomalous expansion of water. And since density of a substance is inversely proportional to Volume (Density decreases with increase in Volume). Therefore water has highest Density at 4 deg C and lowest Volume.

Que 7: B



Que 8: A

Gaganyaan Project(GS3)

- It is India's first Human Space Flight Programme set for 2022.
- It will make India the 4th nation in the world to launch a Human to space, after the USA, Russia and China.
- It is being operating under a newly formed Centre, Human Space Flight Centre (HSFC).

Objectives of Gaganyaan Mission-

1.Enhance of science and technology levels in the country,

2.Serve as national project involving several institutes,

3.Inspire youth,

4.Develop technology for social benefits and

5.Improve international collaboration

6.Improve of industrial growth.

Que 9: A

1st Law of motion: whenever the body is in continues position of rest or motion, it tends to do so; unless an external unbalanced force is applied on it. F = m*a (mass*acceleration)
So as F increases, acceleration also increases Also as mass increases, acceleration will decrease.

Que 10: B

Aries (Aryabhatta Research Institute of Observational Sciences)
Indian Prime Minister Narendra Modi and Belgian Prime Minister Charles Michel unveiled Asia's largest optical telescope in Nainital, Uttarakhand.

Que 11: C

According to the Energy Information Administration report, India's shale gas reserves equals 96 trillion cubic feet which can supply for 26 years of the country's Gas demand. Some scientists working with the National Geophysical Research Institute (NGRI) in Hyderabad, claimed to identify 28 sedimentary basins of shale gas.
Shale gas, an unconventional source of energy found in non-porous rocks, has drawn increasing international attention after becoming an important source of natural gas in the US and Canada.
Conditions for shale gas exploration are not conducive in India as the availability of huge water resources, needed for shale gas operations, remains a formidable challenge.
Shale gas exploration not only involves the use of fresh water but land acquisition, which also emerges as a potential issue due to the large tracts of land required for fracking that may lead to displacement of people.

shale gas exploration might impact agricultural activities and lead to water contamination. So its is a big challenge in India.

The gas produced from such reservoir rocks is known as 'tight gas' and it requires massive hydraulic fracturing technique. So the potential impacts of hydraulic fracturing locally and downstream of drilling areas is also a big concern.

India grows over 850,000 tons, or 80% of the total guar produced all over the world. 75% of the guar gum or derivatives produced in India are exported, mainly to USA and to European countries. Rajasthan in western India is the major guar producing state, accounting for 70% of the production.

Que 12: A

RCI is entrusted with the responsibility of carrying out research and development in the technologies of Control Engineering, Inertial Navigation, Imaging Infrared seekers, RF Seekers & Systems, On-board Computers and Mission Software.

The Indian Ballistic Missile Defence (BMD) Programme is an attempt to develop and to use a multi-layered ballistic missile defence system to protect from ballistic missile attacks.

India seeks to deploy a functional 'iron dome' ballistic missile defence (BMD), incorporating both low-altitude and high-altitude interceptor missiles.

Two- tiers of India's BMD - Prithvi Air Defence (PAD) and Advanced Air Defence (AAD).

Prithvi Air Defence (PAD) - Also referred as Pradyumna Ballistic Missile Interceptor. It's designed for High altitude interception (exo-atmospheric interception). Intercept missiles at altitudes between 50 – 80 km.

Advanced Air Defence (AAD)-Also called Ashwin Ballistic Missile Interceptor. It's endo-atmospheric interception system (for low altitude interception). Altitude of interception is range up to 30 km.

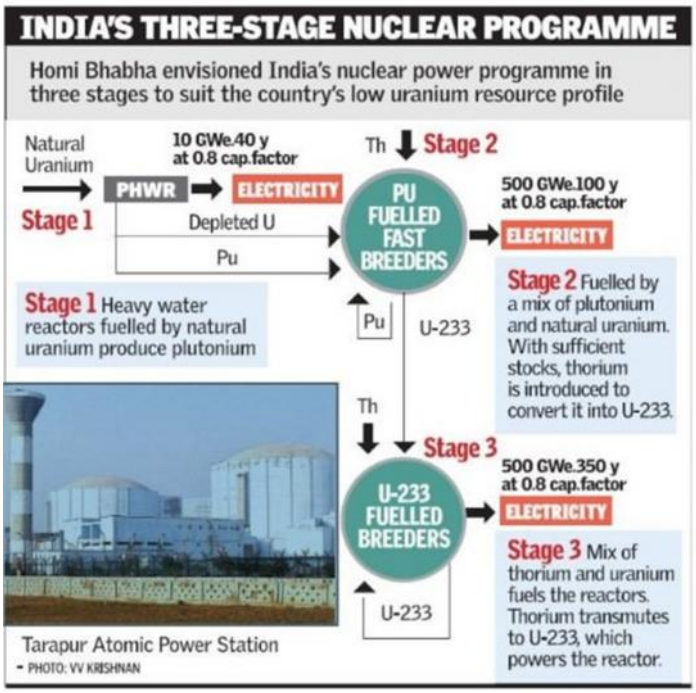
Que 13: B

Barak 8 (LR-SAM or as MR-SAM) is an Indian-Israeli surface-to-air missile (SAM), designed to defend against any type of airborne threat including aircraft, helicopters, anti-ship missiles, and UAVs as well as cruise missiles and combat jets.

Que 14: D

A Stage III reactor or an Advanced nuclear power system involves a self-sustaining series of thorium-232-uranium-233 fuelled reactors.

This would be a thermal breeder reactor, which in principle can be refueled – after its initial fuel charge – using only naturally occurring thorium.



Que 15: A

Simple evaporation & condensation methods, air rises up expand and as it expands, it cools down into water droplets. As the gas is expanding, it losing energy in form of latent heat of condensation and hence temperature comes down.

(don't go into Charles Law since it says at constant pressure. In the Question, its nowhere written that the pressure is constant and also since statement A is talking about air water vapour, pressure can't be constant).

Que 16: D

Speed of sound increases with increasing density. Speed of sound is maximum in solid, then liquid and then gases.

Que 17: A

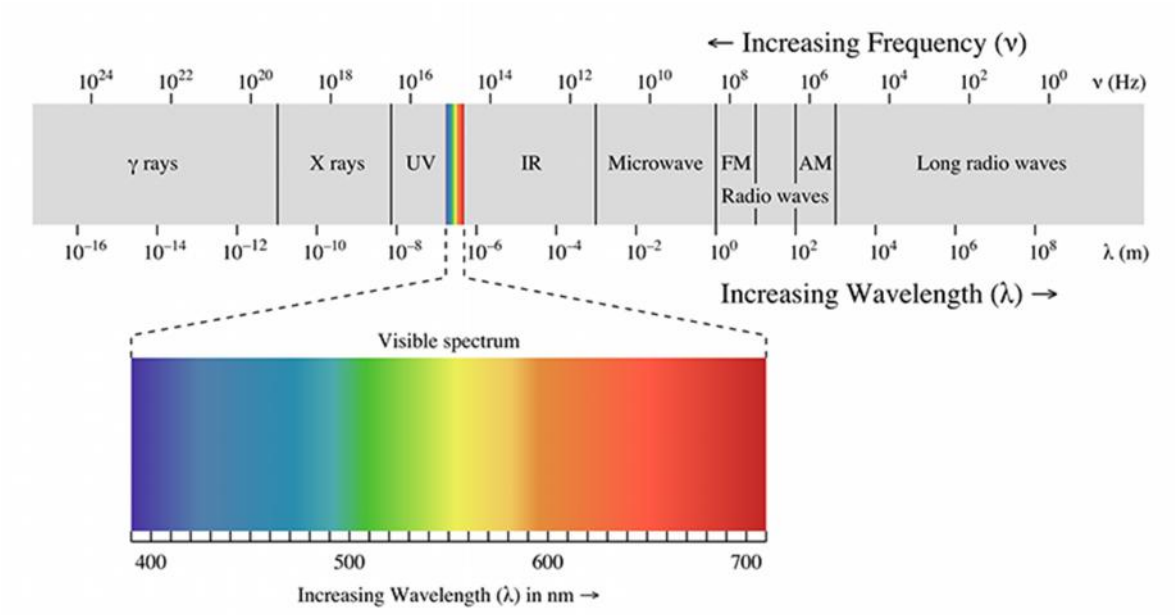
Self-explanatory

Que 18: A

Although it is the second planet from the sun, Venus is the hottest planet in the solar system. The reason Venus is hotter than even Mercury is not because of its position in the solar system but because of its thick, dense cloud layer.

The atmosphere of Venus is made up almost completely of carbon dioxide, with traces of nitrogen. Much of the hydrogen in the atmosphere evaporated early in the formation of Venus, leaving a thick atmosphere across the planet.

Que 19: D



As wavelength increases, energy decreases therefore ionizing power would also decrease. For the light wave, the speed is of speed of light, irrespective of its wavelength and frequency.

Que 20: B

The color perceived depends on how much each type of cone is stimulated. Yellow is perceived when the yellow-green receptor is stimulated slightly more than the blue-green receptor. The eye is most sensitive to green light (555 nm) because green stimulates two of the three kinds of cones, L and M, almost equally.

Que 21: D

In astronomy, axial precession is a gravity-induced, slow, and continuous change in the orientation of an astronomical body's rotational axis. In particular, it can refer to the gradual shift in the orientation of Earth's axis of rotation in a cycle.

The physical cause of the precession is a torque (twisting) of the earth, caused mostly by the sun's and the moon's gravity pulling on the equatorial bulges of the earth.

Albert Einstein suggested the mass imbalances of off-center ice caps would eventually grow large enough to tug the crust of the Earth out of it’s seemingly stable position.

Any flow of magna in outer could destabilize the whole core and lead to changes in balanced precession of earth.

Huge earthquake in plates can re-distribute the mass balance and change the distribution of precession.

Que 22: D

Light travels at different speeds in different materials.

The frequency of the refracted ray remains constant.Due to partial reflection and absorption of light at the interface, the intensity of the refracted ray will be less than the incident ray.When the light crosses the boundary between two different media, deviation of light occurs resulting in refraction such that there is a change in wavelength and speed of light.

Que 23: D

As the satellite is always present in the sky and we do not need to keep changing its antenna direction much, it is used to study about the region it points at.

- Used as weather satellites to predict weather of the satellite.
- Communication satellites. Eg. Dish antennas of TV
- Military purposes. Activities of other countries can be scanned using these satellites
- Global Positioning System

Que 24: D

As temp will increase, the gas molecules will gain more KE and hence more movement and increase the pressure of the vessel. Take eg pressure cooker.

First of all, the gas will no longer be a gas at absolute zero, but rather a solid.

Atoms, being very tiny particles, must be analyzed using quantum mechanics, and one of the cornerstones of this theory is the Heisenberg Uncertainty Principle (HUP). If the atoms were totally motionless, then both the position and momentum uncertainties would be zero, disobeying HUP.

Charles's law says that the volume of a gas is directly proportional to its temperature under constant pressure demonstrates.

Que 25: B

Fluorine is the most reactive of the halogens because it is at the top of the halogen group, which is the second to right group on the periodic table. With halogens, the higher an element is in the column, the more reactive it is. Halogens are reactive because the outer shells that orbit the nucleus lack electrons.

Que 26: B

Ultima Thule

It is located in the Kuiper belt in the outermost regions of the Solar System, beyond the orbit of Neptune.

NASA’s New Horizons spacecraft became the first explorer to fly past the mysterious object- Ultima Thule, located some 4 billion miles from Earth.

Que 27: A

ASTROSAT is India's first dedicated multi wavelength space observatory. This scientific satellite mission endeavours for a more detailed understanding of our universe. One of the unique features of ASTROSAT mission is that enables the simultaneous multi-wavelength observations of various astronomical objects with a single satellite.

Que 28: D

Yuva Vigyani Karyakram (YUVIKA)

- Indian Space Research Organization (ISRO) has launched a special program for School Children called "Young Scientist Program" or "YUva VIgyani KAryakram".
- It is primarily aimed at imparting basic knowledge on Space Technology, Space Science and Space Applications to the younger in order to develop their interest in the emerging areas of Space activities.
- The students who have finished 8thstandard and currently studying in 9th standard will be eligible for the program.

Que 29: B

Sudarshan is an Indian laser-guided bomb kit, developed by Aeronautical Development Establishment (ADE), a DRDO lab.

Laser-guided bombs are called "smart bombs" because they are can follow a non-ballistic trajectory when laser designation of the intended target is done. A laser-guided bomb can hit its target with greater accuracy that ordinary dumb bombs. LGBs are manoeuvrable, free-fall weapons requiring no electronic interconnection to the aircraft. The bomb, once released by the aircraft, will seek the target and glide towards it using laser beam riding.

Que 30: D

Arsenic contamination of groundwater is a form of groundwater pollution which is often due to naturally occurring high concentrations of arsenic in deeper levels of groundwater. It is a high-profile problem due to the use of deep tubewells for water supply in the Ganges Delta, causing serious arsenic poisoning to large numbers of people.

In the Ganges Delta, Groundwater closer to the surface typically has spent a shorter time in the ground, therefore less likely to have concentration of arsenic; water deeper than 100 meters is exposed to much older sediments which have already been depleted of arsenic.

According to the World Health Organisation, "In Bangladesh, West Bengal (India), and some other areas most drinking-water used to be collected from open dug wells and ponds with little or no arsenic, but with contaminated water transmitting diseases such as diarrhoea, dysentery, typhoid, cholera, and hepatitis. Seven of the twenty districts of West Bengal have been reported to have ground water arsenic concentrations above 0.05 mg/L.

In Bihar, Groundwater in 13 districts have been found to be contaminated with arsenic with quantities exceeding 0.05 mg/L.

Que 31: A

Symbiosis in lichens is the mutually helpful symbiotic relationship of green algae and/or blue-green algae (cyanobacteria) living among filaments of a fungus, forming lichen.. Living as a symbiont in a lichen appears to be a successful way for a fungus to derive essential nutrients.

Que 32: A

A Lagrange point is a location in space where the combined gravitational forces of two large bodies, such as Earth and the sun or Earth and the moon, equal the centrifugal force felt by a much smaller third body.

A Satellite placed in the halo orbit around the Lagrangian point 1 (L1) of the Sun-Earth system has the major advantage of continuously viewing the Sun without any occultation/ eclipses. Aditya-L1 mission will be inserted in a halo orbit around the Lagrange point L1, which is 1.5 million km from the Earth. The satellite carries additional six payloads with enhanced science scope and objectives.

Que 33: B

Self-Explanatory

Que 34: C

ISRO's Scramjet Engine Technology Demonstrator Successfully Flight Tested

Today, satellites are launched into orbit by multi-staged satellite launch vehicles that can be used only once (expendable). These launch vehicles carry oxidiser along with the fuel for combustion to produce thrust. Launch vehicles designed for one time use are expensive and their efficiency is low because they can carry only 2-4% of their lift-off mass to orbit. Thus, there is a worldwide effort to reduce the launch cost.

Nearly 70% of the propellant (fuel-oxidiser combination) carried by today's launch vehicles consists of oxidiser. Therefore, the next generation launch vehicles must use a propulsion system which can utilise the atmospheric oxygen during their flight through the atmosphere which will considerably reduce the total propellant required to place a satellite in orbit.

Also, if those vehicles are made re-usable, the cost of launching satellites will further come down significantly. Thus, the future re-usable launch vehicle concept along with air-breathing propulsion is an exciting candidate offering routine access to space at far lower cost.

Considering the strategic nature of air-breathing technology which has the potential to bring a significant shift in the launch vehicle design, worldwide efforts are on to develop the technology for air breathing engines. Ramjet, Scramjet and Dual Mode Ramjet (DMRJ) are the three concepts of air-breathing engines which are being developed by various space agencies. Ramjets

A ramjet is a form of air-breathing jet engine that uses the vehicle's forward motion to compress incoming air for combustion without a rotating compressor. Fuel is injected in the combustion chamber where it mixes with the hot compressed air and ignites. A ramjet-powered vehicle requires an assisted take-off like a rocket assist to accelerate it to a speed where it begins to produce thrust.

Ramjets work most efficiently at supersonic speeds around Mach 3 (three times the speed of sound) and can operate up to speeds of Mach 6. However, the ramjet efficiency starts to drop when the vehicle reaches hypersonic speeds.

A scramjet engine is an improvement over the ramjet engine as it efficiently operates at hypersonic speeds and allows supersonic combustion. Thus it is known as Supersonic Combustion Ramjet, or Scramjet.

Dual Mode Ramjet

A dual mode ramjet (DMRJ) is a type of jet engine where a ramjet transforms into scramjet over Mach 4-8 range, which means it can efficiently operate both in subsonic and supersonic combustor modes.

An important development in ISRO's Air Breathing Propulsion Project (ABPP) occurred on August 28, 2016, which was the successful flight testing of its Scramjet.

This first experimental mission of ISRO's Scramjet Engine towards the realisation of an Air Breathing Propulsion System was successfully conducted from Satish Dhawan Space Centre SHAR, Sriharikota.

Que 35: C

'Innovation in Science Pursuit for Inspired Research' (INSPIRE) scheme is one of the flagship programmes of Department of Science & Technology (DST), Government of India. The INSPIRE Awards - MANAK (Million Minds Augmenting National Aspirations and Knowledge), being executed by DST with National Innovation Foundation – India (NIF), an autonomous body of DST, aims to motivate students in the age group of 10-15 years and studying in classes 6 to 10. The objective of the scheme is to target one million original ideas/innovations rooted in science and societal applications to foster a culture of creativity and innovative thinking among school children.

Que 36: D

The retina is the innermost, light-sensitive layer of tissue of the eye of most vertebrates and some molluscs. The optics of the eye create a focused two-dimensional image of the visual world on the retina, which translates that image into electrical neural impulses to the brain to create visual perception, the retina serving a function analogous to that of the film or image sensor in a camera.

Que 37: A

Free radicals created from oxidation can harm the cells in your body. Antioxidants protect you from the destruction of free radicals by binding together to decrease their harmful effects. To some extent, antioxidants can reverse damage already caused by free radicals.

The three major antioxidant vitamins are beta-carotene, vitamin C, and vitamin E. Lutein, lycopene and selenium are other natural antioxidants found in foods. Vit D is not an anti-oxidant.

Que 38: C

Self-Explanatory

Que 39: C

Ultrasound imaging works by emitting high frequency acoustic waves. When those waves bounce off an object, they return to the ultrasound equipment, which translates the waves into an image.

But some materials, such as bone or metal, have physical characteristics that block or distort ultrasound's acoustic waves. These materials are called aberrating layers.

The researchers addressed this problem by designing customized metamaterial structures that take into account the acoustic properties of the aberrating layer and offsetting them. The metamaterial structure uses a series of membranes and small tubes to achieve the desired acoustic characteristics.

Que 40: B

Types of Iron Ore – Haematite, Magnetite, Limonite & Siderite. Distribution of Iron Ore in India – Iron ore in Orissa, Jharkhand, Chhattisgarh, Karnataka and other states.
Largest amount is of heamatite(~18,000 million tonnes) and then magnetite (~10,500 million tonnes).

Que 41: B

Some elements in relatively large amounts, the soil supplies to the plants are often called the macronutrients for plants. These includes carbon, hydrogen, oxygen, Nitrogen, phosphorous, potassium, sulphur, magnesium, calcium.

Micro-nutrient includes iron ,manganese, copper, molybdenum, zinc, boron, chloride, nickel.
These 17 elements are called essential elements.
Roles of these elements are given in Class XI biology pg 197.

Que 42: D

Minerals are inorganic chemical elements that the body needs for healthy growth and metabolism. They are also involved in making hormones and enzymes. Minerals are just as important as vitamins, and in fact work in conjunction with vitamins to perform many bodily functions such as bone formation, heart function and digestion.

The minerals are used for a variety of physiological processes such as building blood and bone, making hormones, regulating heartbeat, and more. There are two types of minerals.
Macrominerals are needed in large amounts. Trace minerals are needed in very small amounts.
The macrominerals are calcium, phosphorus, magnesium, sodium, potassium, chloride, and sulfur.
The trace minerals are iron, manganese, copper, iodine, zinc, cobalt, fluoride, and selenium.

Que 43: C

The word photoheterotroph derives its meaning from the three words “photo,” “hetero,” and “troph” which mean light, other, and nourishment respectively.
Photoheterotrophs mostly use light as their source of energy and derives its carbon from organic compounds. They do not use carbon dioxide as their source of carbon.
Some of the photoheterotrophic organisms include heliobacteria, purple non-sulfur bacteria, and green non-sulfur bacteria. The oriental hornet, as well as some sap-sucking insects, are also thought to be photoheterotrophs, supplementing their energy supply with light.

Que 44: A

Weightlessness is the complete or near-complete absence of the sensation of weight. It occurs in the absence of any contact forces upon objects including the human body.

Common misconception is that an object becomes weightless when the force of gravity becomes equal to zero. Strictly speaking, this statement would be true if not for the fact that the force of gravity can never be exactly equal to zero (see the lesson on gravitation for more details about the formula for the force of gravity). This is because gravity has an effect even over incredibly long distances, despite the fact that it is the weakest of the fundamental forces.

The reason I feel my own weight when standing is because the ground is pushing upward on me. The more force I feel from the ground (or any other surface), the "heavier" I feel. This force that I feel from a contacting surface is commonly referred to as the normal force. In general, there is usually a force (like gravity) that pushes or pulls the body toward the surface. In response, the surface pushes back on the body in question. We can determine how hard this surface pushes by looking at the net force.

the feeling of weightlessness is achieved when both the object and its surroundings experience the same net acceleration.

https://www.physicsclassroom.com/class/circles/Lesson-4/Weightlessness-in-Orbit

Que 45: A

Some elements in relatively large amounts, the soil supplies to the plants are often called the macronutrients for plants. These includes carbon, hydrogen, oxygen, Nitrogen, phosphorous, potassium, sulphur, magnesium, calcium.

Micro-nutrient includes iron ,manganese, copper, molybdenum, zinc, boron, chloride, nickel.

These 17 elements are called essential elements.

Que 46: A

Disaccharides are sugars or carbohydrates made by linking two monosaccharides.This occurs via a dehydration reaction and a molecule of water is removed for each linkage. A glycosidic bond can form between any hydroxyl group on the monosaccharide.

The three most common disaccharides are Maltose, lactose, sucrose.

Glucose and fructose are monosaccharides.

Starch and cellulose are polysaccharides.

Que 47: B

There are three different ways in which oxidation of glucose (or sugar) may happen. First is aerobic respiration which gives pyruvic acid and CO_2. Second and third are partial oxidation or anaerobic respiration. Lactic acid fermentation is one and alcoholic fermentation is another. CO_2 is the byproduct of both these process.

Que 48: A

Mitosis is a continuum process of cell division which occurs in all types of living cells. It is found in eukaryotic cells and is type of asexual reproduction hence the offsprings are identical to their parent.
The primary function of mitosis is general growth and repair. It is also used for cell reproduction. Meiosis, on the other hand, aims to provide genetic diversity through sexual reproduction.

Que 49: D

Colour blindness is X chromosome sex linked disease. there is a 50% chance that the child will be colorblind. If it is a boy, it will be colorblind, but if it is a girl, it will only be a carrier. Mother's chromosome is XrXr and Father's Chromosome is XRY, which means the children's genotypes will be XRXr if girl and XrY if a boy.

Que 50: C

Self-Explanatory

Que 51: A

Self-Explanatory

Que 52: C

Self-Explanatory

Que 53: C

Self-Explanatory

Que 54: D

Mitochondria, which exist within human cells but have their own DNA, need many different proteins to function.
Mitochondria is absent in Bacteria and also in Blue-Green algae as well. Mitochondria are seen in eukaryotic cells used for respiration purposes. Bacteria are prokaryotes and they do not have mitochondria.

Que 55: D

Self-Explanatory

Que 56: B

Archimedes' Principle: When a body is immersed fully or partially in a fluid, it experiences an upward force that is equal to the weight of the fluid displaced by it.

Archimedes' principle has many applications. It is used in designing ships and submarines. Lactometers, which are used to determine the purity of a sample of milk and hydrometers used for determining density of liquids, are based on this principle.

Anemometer is instrument which measures speed of Air. Hence Archimedes' principle cannot be used there.

Que 57: C

Self-Explanatory

Que 58: D

All objects glow. The hotter they are, the more they glow. Objects cooler than red-hot radiate in the infrared, or microwave, or even radio.
Hotter objects radiate in microwaves; still hotter in infrared (and we can feel the heat.) Even hotter and it becomes "red-hot" we start to be able to see some of the radiation. Then orange-hot, yellow hot, white-hot. Then blue-white hot, where there is enough blue and violet in the mix to tint the white blue.
Shot wavelength means high energy and thus bodies with high energy radiate more intensively.

Que 59: D

WiMAX , LTE , and HSPA+ are all versions of 4G , WiMAX is used by Sprint , LTE is used by Verizon and AT&T, HSPA+ is used by AT&T and T-Mobile , 4G LTE network supports the global access , the service portability & scalable mobile services , It supports IP based mobile system-High speed , high capacity & low cost per bit .
4G wireless technology is also referred to by "MAGIC" which stands for *Mobile multimedia, Any-where, Global mobility solutions over, integrated wireless and Customized services.*
4G uses OFDMA and other new technologies (Single Carrier FDMA, Interleaved FDMA, and Multi-carrier CDMA) instead of CDMA, which is used by all 3-G systems.
WiMAX (Worldwide Interoperability for Microwave Access) is an IP based, wireless broadband access technology which will form base for 4G.
4G LTE (Long Term Evolution) also referred to as E-UTRA (Evolved UMTS Terrestrial Radio Access) or E-UTRAN(Evolved UMTS Terrestrial Radio Access Network).

Que 60: B

A nano-pharmaceutical is defined as "a pharmaceutical preparation containing nanomaterials intended for internal use or external application on human for the purpose of therapeutics, diagnostics and health benefits."

Significance:

a) Enhanced solubility and dissolution rate.

b) Enhanced oral bioavailability.
c) Improved dose proportionality.
d) Reduced food effects.
e) Suitability for administration by all routes and possibility of sterile filtration due to decreased particle size range.

Biodegradable:
Biodegradable nanoparticles have been used frequently as drug delivery vehicles due to its improved bioavailability, better encapsulation, control release and reduction of toxic potential. Examples of biodegradable nanoparticles are PEG, albumin, PLA, PLGA, chitosan, gelatin, polycaprolactone, poly-alkyl-cyanoacrylates, etc.

Nonbiodegradable:
Nonbiodegradable nanoparticles are relatively less used in pharmaceutical products (though these systems are more commonly used in cosmeceuticals). Almost all non-biodegradable nanoparticles have potential to cause cytotoxic effects of particle due to long sequestration without significant degradation and excretion. Some examples of non biodegradable nanoparticles are titanium oxide, iron oxide, and metals such as gold, silver, platinum, etc…

Que 61: C

Antibiotics work against bacterial infections for the treatment of infections like throat infections, bladder infections, and skin infections. They do not work against viral infections.
Fungi and viruses are also be a danger to humans, and they are targeted by antifungals and antivirals, respectively. Only substances that target bacteria are called antibiotics, while the name antimicrobial is an umbrella term for anything that inhibits or kills microbial cells including antibiotics, antifungals, antivirals and chemicals such as antiseptics.

Que 62:

An open circulatory system is a type of circulatory system in which nutrients and waste are moved through the body with the assistance of a fluid which flows freely through the body cavity, rather than being contained in veins. Animals with an open circulatory system tend to be small organisms, so the blood doesn’t have far to travel. These animals typically have low metabolisms. They don’t tend to need quick energy or immune defenses.
Animals with a closed circulatory system tend to be larger than those with an open circulatory system.
There are several different heart configurations for an animal with a closed circulatory system. Most mammals have a four-chambered heart, which separates the oxygenated blood from the deoxygenated blood. A fish has a two-chambered heart, which pumps blood directly to the gills to become oxygenated

and then throughout the body. Amphibians have three-chambered hearts, where oxygenated and deoxygenated blood mix within the heart before being pumped to the body.

Que 63: C

Glycogen is a multibranched polysaccharide of glucose that serves as a form of energy storage in animals, fungi, and bacteria. The polysaccharide structure represents the main storage form of glucose in the body. Glycogen functions as one of two forms of energy reserves, glycogen being for short-term and the other form being triglyceride stores in adipose tissue (i.e., body fat) for long-term storage. In humans, glycogen is made and stored primarily in the cells of the liver and skeletal tissues.

Que 64: A

Self-explanatory

Que 65: B

Self-explanatory

Que 66: C

Self-explanatory

Que 67: C

Sodium is the primary ion with a positive charge in the body. This balances the net negative charge on proteins leading to a generally net neutral balance of electrical charges.

Sulfur is a macro mineral that which plays an important part of many biochemical reaction like in the synthesis of protein and enzyme reactions. As well as this it maintains the balance of oxygen in the body and keeps skin, hair and nails healthy. Another thing, is that it plays a rather important role in producing collagen, a type of protein found in connective tissue, keratin and hair. Sulfur is also used to treat skin diseases, rheumatism, gout, bronchitis and prevents constipation.

About 70 percent of your body's iron is found in the red blood cells of your blood called hemoglobin and in muscle cells called myoglobin. Hemoglobin is essential for transferring oxygen in your blood from the lungs to the tissues. Myoglobin, in muscle cells, accepts, stores, transports and releases oxygen.

The strongest evidence for a beneficial effect of omega-3 fats has to do with heart disease. These fats appear to help the heart beat at a steady clip and not veer into a dangerous or potentially fatal erratic rhythm. Omega-3 fats also lower blood pressure and heart rate, improve blood vessel function, and, at higher doses, lower triglycerides and may ease inflammation, which plays a role in the development of atherosclerosis.

Que 68: B

The medulla oblongata is a portion of the hindbrain that controls autonomic functions such as breathing, digestion, heart and blood vessel function, swallowing, and sneezing. Motor and sensory neurons from the midbrain and forebrain travel through the medulla. As part of the brainstem, the medulla oblongata helps transfer messages between parts of the brain and spinal cord.

Hypothalamus is involved in homeostasis and the regulation of both the sleep-wake cycle and in food and water intake.

Que 69: C

Mollusca They have an open circulatory system and kidney like organs for excretion. There is a little segmentation. There is a foot that is used for moving around. E.g. Snails and mussels, octopus.

Echinodermate There are spiny skinned organisms. These are exclusively free living marine animals. They have peculiar water driven tube system that they use for moving around. They have hard calcium carbonate structure that they use as skeleton. E.g.- Starfish, Sea cucumber.

Que 70: A

In many aquatic ecosystems, the pyramid of biomass may assume an inverted form. (In contrast, a pyramid of numbers for the aquatic ecosystem is upright)

This is because the producers are tiny phytoplankton that grows and reproduces rapidly.

Here, the pyramid of biomass has a small base, with the consumer biomass at any instant exceeding the producer biomass and the pyramid assumes an inverted shape.

Que 71: A

The Orca, also known as the Killer Whale, is the largest of the dolphin family. It can be found in most of the world's oceans. Orcas can prey on almost any animal they find in the sea, in the air over the water or along the coastline. Orcas have very distinction coloring with a black back, white chest and sides, and a white patch above and behind the eye.

The orca is considered very intelligent and trainable. The orca's playfulness and sheer size make them a popular exhibit at aquariums and aquatic theme parks.

Que 72: C

Self-explanatory

Que 73: B

Sunspots are darker, cooler areas on the surface of the sun in a region called the photosphere.

The photosphere has a temperature of 5,800 degrees Kelvin. Sunspots have temperatures of about 3,800 degrees K. They look dark only in comparison with the brighter and hotter regions of the photosphere around them.

Sunspots can be very large, up to 50,000 kilometers in diameter. They are caused by interactions with the Sun's magnetic field which are not fully understood. But a sunspot is somewhat like the cap on a soda bottle: shake it up, and you can generate a big eruption. Sunspots occur over regions of intense magnetic activity, and when that energy is released, solar flares and big storms called coronal mass ejections erupt from sunspots.

Que 74: C

Speed of sound is greater in denser medium. Ocean water is dense due to presence of water particles in form of humidity so sound will travel faster in it.

Moist air is denser than dry air due to presence of humidity.

Que 75: A

Silicol gel or silica gel is dehydrating agent.

- Zeolites- Any of a large group of minerals consisting of hydrated aluminosilicates of sodium, potassium, calcium, and barium. They can be readily dehydrated and rehydrated, and are used as cation exchangers and molecular sieves.
- Silicone lubricant is an excellent choice to separate two moving surfaces, though it is not ideal for all lubricating applications. One of the chief properties of silicone, the fact that they have linear polymers that slide over one another, gives silicone gels and oils lubricating properties, according to Dow Corning.
- Asbestos was long considered an ideal material for almost all types of insulation, until its cancer-causing effects were revealed to the public. The naturally occurring mineral has a unique fibrous nature that allows it to take on a cotton-like consistency.

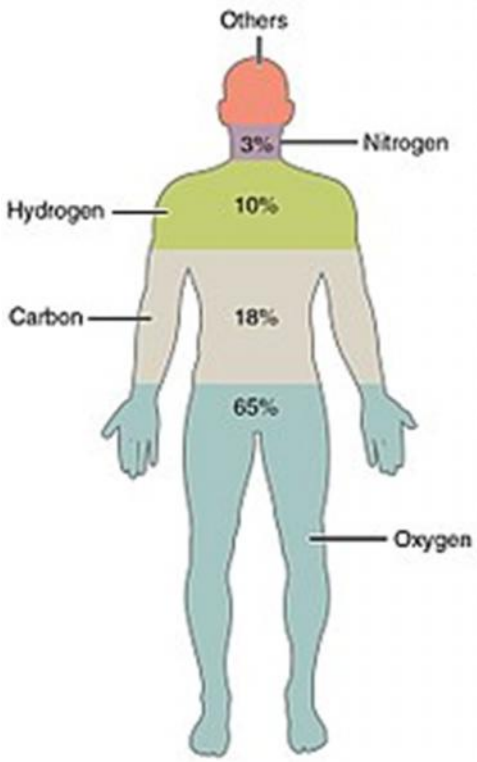
Que 76: C

Fluorescence is the emission of light by a substance that has absorbed light or other electromagnetic radiation. It is a form of luminescence. In most cases, the emitted light has a longer wavelength, and therefore lower energy, than the absorbed radiation.

An example of fluorescence occurs when the absorbed radiation is in the ultraviolet region of the spectrum, and thus invisible to the human eye, while the emitted light is in the visible region, which gives the fluorescent substance a distinct color that can be seen only when exposed to UV light. Fluorescent materials cease to glow nearly immediately when the radiation source stops, unlike phosphorescent materials, which continue to emit light for some time after.

Fluorescence has many practical applications, including mineralogy, gemology, medicine, chemical sensors (fluorescence spectroscopy), fluorescent labelling, dyes, biological detectors, and cosmic-ray detection. Its most common everyday application is in energy-saving fluorescent lamps and LED lamps, where fluorescent coatings are used to convert short-wavelength UV light or blue light into longer-wavelength yellow light, thereby mimicking the warm light of energy-inefficient incandescent lamps. Fluorescence also occurs frequently in nature in some minerals and in various biological forms in many branches of the animal kingdom.

Que 77: B



Element	Symbol	Percentage in Body
Oxygen	O	65.0
Carbon	C	18.5
Hydrogen	H	9.5
Nitrogen	N	3.2
Calcium	Ca	1.5
Phosphorus	P	1.0
Potassium	K	0.4
Sulfur	S	0.3
Sodium	Na	0.2
Chlorine	Cl	0.2
Magnesium	Mg	0.1
Trace elements include boron (B), chromium (Cr), cobalt (Co), copper (Cu), fluorine (F), iodine (I), iron (Fe), manganese (Mn), molybdenum (Mo), selenium (Se), silicon (Si), tin (Sn), vanadium (V), and zinc (Zn).		less than 1.0

Que 78: B

Oxygen – 46.6 %; silicon – 27.7%; Aluminium - 8.1%, Iron – 5%, calcium -3.6%.

Que 79:

Earth's density is significantly higher, since it is a terrestrial planet – 5.514 g/cm3 compared to 1.326 g/cm³ for Jupiter, a gas planet. Because of this, Jupiter's "surface" gravity is significantly higher than Earth normal – i.e. 9.8 m/s². Jupiter experiences a gravitational force of 24.79 m/s2

Only two factors impact gravity: mass and size. Alternatively, density and size (since density is mass divided by volume, a measurement of size).

The bigger the mass, the stronger the gravity. The bigger the size for a given mass, the smaller the gravity, since you are farther from the center of mass (the center of the planet). But this is not so important since habitable planets (those with a solid rocky surface) have quite a reduced span of available densities.

Que 80: C

Catalyst lowers the activation energy of the reaction so reaction can happen easily.
Catalyst is used at in the reaction but given back at the end of reaction.
Hormones are protein based catalyst used in metabolism.

Que 81: A

Proteins are carbon compounds with amine groups and carbon dioxide.

Que 82: D

Vitamin C, also known as ascorbic acid and ascorbate, is a vitamin found in various foods and sold as a dietary supplement.
It is used to prevent and treat scurvy. Vitamin C is an essential nutrient involved in the repair of tissue and the enzymatic production of certain neurotransmitters. It is required for the functioning of several enzymes and is important for immune system function. It also functions as an antioxidant.

Que 83: A

Varunastra is ship launched, heavy weight, electrically-propelled anti-submarine torpedo capable of targeting quiet submarines, both in deep and shallow waters in an intense countermeasures environment. Varunastra can be fired from all ASW ships capable of firing heavy weight torpedoes. VARUNASTRA has been inducted by Indian Navy in 2016.

Que 84: B

Dopamine is an organic chemical which functions both as a hormone and a neurotransmitter, and plays several important roles in the brain and body.
It is most commonly used as a stimulant drug in the treatment of severe low blood pressure, slow heart rate, and cardiac arrest.
Dopamine is synthesized in plants and most animals (in brain and kidney). In the brain, dopamine functions as a neurotransmitter—a chemical released by neurons (nerve cells) to send signals to other nerve cells. The brain includes several distinct dopamine pathways, one of which plays a major role in the motivational component of reward-motivated behavior. The anticipation of most types of rewards increases the level of dopamine in the brain.
Addictive drugs increase dopamine release or block its reuptake into neurons following release
Parkinson's disease is an age-related disorder characterized by movement disorders such as stiffness of the body, slowing of movement, and trembling of limbs when they are not in use.[46] In advanced stages it progresses to dementia and eventually death.

Que 85: A

fMRI is a technique for measuring brain activity. It works by detecting the changes in blood oxygenation and flow that occur in response to neural activity.

fMRI can be used to produce activation maps showing which parts of the brain are involved in a particular mental process.
The key to MRI is that the signal from hydrogen nuclei varies in strength depending on the surroundings. This provides a means of discriminating between gray matter, white matter and cerebral spinal fluid in structural images of the brain.

Que 86: A

Atmospheric monitoring station established by National Physical Laboratory in the campus of Institute of Himalayan Bio resource Technology (IHBT) at Palampur (H.P.)

It is situated at an altitude of 1391 m for generating the base data for atmospheric trace species & properties to serve as reference for comparison of polluted atmosphere in India.

At this station, NPL has installed state of art air monitoring system, greenhouse gas measurement system and Raman Lidar.

A number of parameters like CO, NO, NO2, NH3, SO2, O3, PM, HC & BC besides CO2 & CH4 are being currently monitored at this station which is also equipped with weather station (AWS) for measurement of weather parameters.

In India, air quality parameters are mostly measured in industrial and residential areas, however, data for air quality of pristine atmosphere is not available in India. It will also serve as a base station for inter-comparison of air quality monitoring equipment being used in India to improve quality of monitored data in India.

Setting up of such state of art monitoring systems in Himalayan region will help to assess the vulnerability of region's sensitive ecosystem due to climate change & pollution.

Que 87: C

Ministry of Science and Technology has come up with a comprehensive Braille atlas to help nearly 50 lakh visually-challenged people in country, especially students. It is world's first braille atlas for the visually impaired.
Each atlas will include 20 maps on different themes — physical, socio-economic, river system, crop pattern, natural vegetation, cultural, metropolitan areas, and roads and railways.
The atlas has been developed in Hindi and English by the National Atlas and Thematic Mapping Organisation (NATMO).
It is made using indigenously developed silk-screen painting technology.
The maps are embossed with simple lines and point symbols while the area coverage is easily distinguishable in terms of shapes and textures.

Que 88: C

Aflatoxins are toxins produced by certain fungi which are generally found in agricultural crops like maize, peanuts, cotton seed and others. They are carcinogenic in nature.

Aflatoxin-M1 comes in the milk through feed and fodder which are currently not regulated in the country.

According to a WHO study, consumption of food containing aflatoxin concentrations of one milligram per kilogram or higher has been suspected to cause aflatoxicosis, the outcome of which consists of acute liver failure, jaundice, lethargy and nausea, eventually leading to death. Exposure to AFM1 from milk causes stunting among children.

Que 89: A

GEMINI device:

- The Union Minister of Earth Sciences has recently launched the Gagan Enabled Mariner's Instrument for Navigation and Information (GEMINI) device.
- The device is developed for effective dissemination of emergency information and communication.
- Ocean State Forecasts include the forecasts on winds, waves, ocean currents, water temperature, etc. at every 6 hrs on daily basis for next 5 days.
- Indian National Centre for Ocean Information Services (INCOIS) in collaboration with the Airports Authority of India (AAI) utilized the GAGAN (GPS Aided Geo Augmented Navigation) satellite while developing the GEMINI device.
- GEMINI is a portable receiver that is linked to ISRO-satellites, receives and transfers the data received from GAGAN satellite/s to a mobile through Bluetooth communication.
- A mobile application developed by INCOIS decodes and displays the information in nine regional languages.

Que 90: C

Hyperloop is a new form of ground transport currently in development. It could see passengers travelling at over 700 miles an hour in floating pod which races along inside giant low-pressure tubes, either above or below ground.

There are two big differences between Hyperloop and traditional rail. Firstly, the pods carrying passengers travel through tubes or tunnels from which most of the air has been removed to reduce friction. This should allow the pods to travel at up to 750 miles per hour.

Rather than using wheels like a train or car, the pods are designed to float on air skis, using the same basic idea as an air hockey table, or use magnetic levitation to reduce friction.

Hyperloop could be cheaper and faster than train or car travel, and cheaper and less polluting than air travel. They claim that it's also quicker and cheaper to build than traditional high-speed rail. Hyperloop could therefore be used to take the pressure off gridlocked roads, making travel between cities easier, and potentially unlocking major economic benefits as a result.

Que 91: C

Bases are bitter in taste and soapy to touch.

Ions are good conductor of electricity so when strong bases are dissolved in water, it becomes good conductor.

Salts are neutral since they are formed by reaction of acid and bases by neutralization reaction.

Low pH acids have higher concentration of hydrogen ions since they are strong acids and dissociate completely to give more ions.

Que 92: C

The classical Indian philosophy Vaisheshik was the physics of ancient times. It propounded the atomic theory of its founder Kannada. At one time Vaisheshik was regarded as part of the Nyaya philosophy since physics is part of science. But since physics is the most fundamental of all sciences, Vaisheshik was later separated from Nyaya and put forth as a separate philosophy. Vaisheshik is a realistic and objective philosophy of the universe.

Que 93: A

He wrote the hugely influential aryabhatiya- contains a systematic treatment of the position of the planets in space; the nature of the Solar System; and the causes of eclipses of the Sun and the Moon. mathematical part of the Aryabhatiya covers arithmetic, algebra, plane trigonometry and spherical trigonometry. It also contains continued fractions, quadratic equations, sums of power series and a table of sines.

He was the first known person to solve diophantine equations.

Aryabhatiya provides simple solutions to complex mathematical problems. Furthermore, Aryabhatta correctly calculated the areas of a triangle and of a circle. In trigonometry, Aryabhatta gave a table of sines calculating the approximate values at intervals.

One of the most important achievements of Aryabhatta is giving an approximate value of Pi.

he was first to explain that moon and planets shine due to reflected sunlight.

He gave accurate calculations of the length of the day and the year

He explained how the earth *moves around its axis* and he also explained how *the apparent movements of stars in the night sky is, in fact, a relative motion that is caused by the rotation of the earth*.

Although the decimal system for whole numbers was apparently not known to the Indian astronomer Aryabhata (born 476), it was used by his pupil Bhaskara I in 620, who is given credit for decimal system.

Mathematician Brahmagupta and others used small dots under numbers to show a zero placeholder, but they also viewed the zero as having a null value, called “sunya.” Brahmagupta was also the first to show that subtracting a number from itself results in zero.

Que 94:C

The government has released *National Digital Health Blueprint (NDHB)* which aims to create *National Digital Health Eco-System.*

National Digital Health Blueprint (NDHB):

(a) It lays out the 'building blocks' for the implementation of the National Health Stack (NHS), which aims to deploy Artificial Intelligence (AI) in leveraging health records.

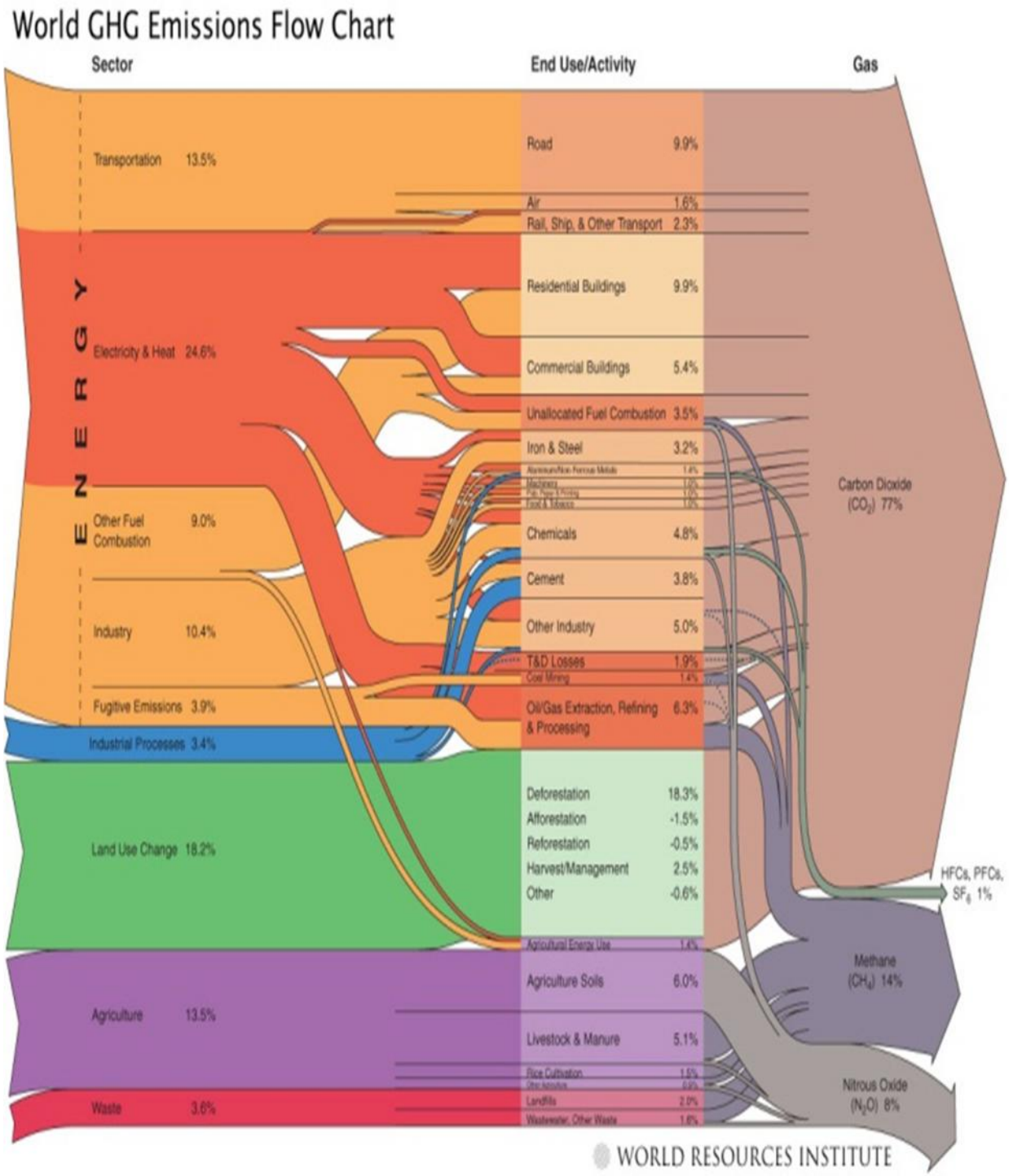
(b) Keeping true to the government's larger agenda, of 'data as a public good', the blueprint proposes the linking of multiple databases to generate greater and granular data that can be leveraged by the public as well as private sector – including insurance companies, hospitals, apps and researchers.

(c) The blueprint proposes a National Digital Health Mission "as a purely government organisation with complete functional autonomy adopting some features of some of the existing National Information Utilities like UIDAI and GSTN."

Objectives:

1. *To establish national and regional registries to create single source of truth* in respect of Clinical Establishments, Healthcare Professionals, Health Workers and Pharmacies.
2. *Creating a system of Personal Health Records* accessible to the citizens and to the service providers based on citizen-consent.
3. *Promoting the adoption of open standards by all the actors* in the National Digital Health Ecosystem.
4. *Promoting Health Data Analytics* and Medical Research.

Que 95: A



Que 96: A

A quantum bit (qubit) is the smallest unit of quantum information, which is the quantum analog of the regular computer bit, used in the field of quantum computing. A quantum bit can exist in superposition, which means that it can exist in multiple states at once. Compared to a regular bit, which can exist in one of two states, 1 or 0, the quantum bit can exist as a 1, 0 or 1 and 0 at the same time. This allows for very fast computing and the ability to do multitudes of calculations at once, theoretically.

Que 97: C

A lipoprotein is a biochemical assembly whose primary purpose is to transport hydrophobic lipid molecules in water, as in blood plasma or other extracellular fluids.

HDL, high density lipoprotein – this has the highest protein: lipid ratio, and so is the densest. This is also called 'good cholesterol', because it carries cholesterol away from the tissues to the liver, lowering blood cholesterol levels. High HDL levels are associated with lowered risk of cardiovascular disease. HDL levels are higher with exercise, higher estrogen levels, with alcohol consumption, and weight loss.

Que 98: C

Blood pH measures the acidity of the blood, and normal levels are anywhere between 7.35 and 7.45.

The normal pH range for saliva is 6.2 to 7.6.

A ripe banana contains 319 mg of citric acid and another predominant organic acid in a banana is malic acid.

Wine and beer are neutral or acidic in nature.

Toothpaste are basic due to chemical actions.

Que 99: D

The nitrogen bases Adenine (A) , Guanine (G), cytosine (C), Thymine (T) , and uracil (U),

Adanine and Guanine are purines base &. Other three are pyrimidine bases.

Uracil is present in RNA & absent in DNA. Whereas , Thymine is present in DNA & absent in RNA.

Que 100: A

The World Health Organization (WHO) declared an official name for the new Coronavirus Disease: COVID-19 — making sure not to reference Wuhan, the central Chinese city where the virus originated. COVID-19 stands for Corona Virus Disease 19.

On 12 February 2020, the novel coronavirus was named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) while the disease associated with it is now referred to as COVID-19. It is a new strain of coronavirus that has not been previously identified in humans. Outbreaks of novel virus infections among people are always of public health concern, especially when there's little knowledge about the characteristics of the virus, how it spreads between people, how severe are the resulting infections and how to treat them.